WHAT IS CLAIMED IS:

1. A pixel signal processing apparatus that, given a group of pixel signals from pixels arrayed on a two-dimensional plane, each pixel having one of a first to an N-th spectral characteristic, generates a pixel signal having an L-th spectral characteristic at a first pixel position of interest where there is a pixel signal having a K-th spectral characteristic (K and L being different integers between 1 and N, inclusive), comprising:

a regression analysis means for performing a regression analysis in a plurality of pixel positions in an area neighboring the first pixel position of interest, using the pixel signals having the K-th spectral characteristic as an explanatory variable and the pixel signals having the L-th spectral characteristic as a purpose variable, to calculate a regression equation expressing a correlation of the pixel signals having the K-th spectral characteristic with the pixel signals having the L-th spectral characteristic; and

a calculating means for determining the pixel signal having the L-th spectral characteristic at the first pixel position of interest by applying a conversion formula based on the regression equation to the pixel signal having the K-th spectral characteristic at the first pixel position of interest.

2. The pixel signal processing apparatus of claim 1, further comprising:

an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane; and

low-pass filtering means for low-pass filtering of the output signals of the imaging device; wherein

the regression analysis means uses pixel signals obtained from the low-pass filtering means as the explanatory variable and the purpose variable.

3. The pixel signal processing apparatus of claim 1, further comprising:

an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane; and

low-pass filtering means for low-pass filtering of the output signals of the imaging device; wherein

the regression analysis means uses pixel signals output from the imaging device as the explanatory variable, and uses pixel signals obtained from the low-pass filtering means as the purpose variable.

4. The pixel signal processing apparatus of claim 1, further comprising an interpolating means for obtaining a pixel signal having the K-th spectral characteristic at a second pixel position of interest where there is a pixel signal having an M-th spectral characteristic (M being an integer from 1 to N different from K) by interpolation based on pixel signals having the M-th spectral characteristic and pixel signals having the K-th spectral characteristic at a plurality of pixel positions in an area neighboring the second pixel position of interest, wherein:

the regression analysis means uses pixel signals obtained by said interpolation as said explanatory variable.

5. The pixel signal processing apparatus of claim 4, further comprising an interpolating means for obtaining a pixel signal having the K-th spectral characteristic at a second pixel position of interest where there is a pixel

signal having an M-th spectral characteristic (M being an integer from 1 to N different from K) by interpolation based on pixel signals having the M-th spectral characteristic and pixel signals having the K-th spectral characteristic at a plurality of pixel positions in an area neighboring the second pixel position of interest, wherein:

the regression analysis means also uses pixel signals obtained by said interpolation as part of said purpose variable.

6. The pixel signal processing apparatus of claim 1, further comprising an interpolating means for obtaining a pixel signal having the K-th spectral characteristic at a second pixel position of interest where there is a pixel signal having an M-th spectral characteristic (M being an integer from 1 to N different from K) by interpolation based on pixel signals having the M-th spectral characteristic and pixel signals having the K-th spectral characteristic at a plurality of pixel positions in an area neighboring the second pixel position of interest, wherein:

the regression analysis means uses pixel signals obtained by said interpolation as part of the purpose variable.

7. The pixel signal processing apparatus of claim 4, wherein:

the interpolating means comprises the regression analysis means and the calculating means;

the regression analysis means performs a regression analysis using the pixel signals having the M-th spectral characteristic in the plurality of pixel positions in the area neighboring the second pixel position of interest as the explanatory variable and the pixel signals having the K-th spectral characteristic in the plurality of pixel

positions in the area neighboring the second pixel position of interest as the purpose variable and calculates a regression equation expressing the correlation between the pixel signals having the M-th spectral characteristic and the pixel signals having the K-th spectral characteristic; and

the calculating means

obtains the pixel signal having the K-th spectral characteristic by applying a conversion formula based on the regression equation to the pixel signal having the M-th spectral characteristic at the second pixel position of interest.

8. The pixel signal processing apparatus of claim 5, wherein:

the interpolating means comprises the regression analysis means and the calculating means;

the regression analysis means performs a regression analysis using the pixel signals having the M-th spectral characteristic in the plurality of pixel positions in the area neighboring the second pixel position of interest as the explanatory variable and the pixel signals having the L-th spectral characteristic in the plurality of pixel positions in the area neighboring the second pixel position of interest as the purpose variable and calculates a regression equation expressing the correlation between the pixel signals having the M-th spectral characteristic and the pixel signals having the L-th spectral characteristic; and

the calculating means

obtains the pixel signal having the L-th spectral characteristic by applying a conversion formula based on the regression equation to the pixel signal having the M-th spectral characteristic at the second pixel position of

interest.

9. The pixel signal processing apparatus of claim 2, wherein the low-pass filtering means uses a mean value or weighted mean value of the pixel signals output from the imaging device as the low-pass filtered output.

10. The pixel signal processing apparatus of claim 1, further comprising an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane, wherein

the regression analysis means determines the correlation of the pixel signals output from the imaging device around the first pixel of interest and uses the pixel signals at pixel positions determined to be strongly correlated as the explanatory variable and the purpose variable.

11. The pixel signal processing apparatus of claim 10, wherein the regression analysis means calculates a difference between the pixel signals of two pixels positioned on opposite sides of the first pixel of interest in the area around the first pixel of interest, the two pixels having the same type of spectral characteristic, determines that the two pixel signals are highly correlated if the difference between them is small, and uses pixels disposed in the direction of a line linking the two pixels having the highest correlation as the explanatory variable and the purpose variable.

12. The pixel signal processing apparatus of claim 10, further comprising low-pass filtering means for low-pass filtering the output signals of the imaging device; wherein

the low-pass filtering means performs low-pass filtering based only on pixels disposed in the direction of a line linking the two pixels having the highest correlation.

13. The pixel signal processing apparatus of claim 1, further comprising an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane, wherein:

the calculating means obtains the pixel signal having the L-th spectral characteristic at the first pixel position of interest by applying a conversion formula based on the regression equation to a pixel signal output from the imaging device.

14. The pixel signal processing apparatus of claim 1, further comprising an interpolating means for obtaining a pixel signal having the K-th spectral characteristic at a second pixel position of interest where there is a pixel signal having an M-th spectral characteristic (M being an integer from 1 to N different from K) by interpolation based on pixel signals having the M-th spectral characteristic and pixel signals having the K-th spectral characteristic at a plurality of pixel positions in an area neighboring the second pixel position of interest, wherein:

the calculating means obtains the pixel signal having the L-th spectral characteristic at the first pixel position of interest by applying a conversion formula based on the regression equation to the pixel signal obtained by interpolation by the interpolating means.

15. The pixel signal processing apparatus of claim 1, wherein:

the regression analysis means selects a line

represented by the following equation (1) as the regression equation

$$y = a \cdot x + b \qquad \ldots(1)$$

('y' being a pixel signal with a Y-th spectral characteristic, 'x' being a pixel signal with an X-th spectral characteristic, 'a' and 'b' being constants); and

the calculating means obtains a pixel signal Y' having the Y-th spectral characteristic at the first or second pixel position of interest by substituting a pixel signal X having the X-th spectral characteristic at the first or second pixel position of interest into the following conversion formula (2) based on said line

$$Y' = a \cdot X + b \qquad \ldots(2)$$

(where X = K, Y = L, and Y' = L' when the pixel signal having the L-th spectral characteristic is generated at the first pixel position of interest,

X = M, Y = K, and Y' = K' when the pixel signal having the K-th spectral characteristic is generated at the second pixel position of interest, and

X = M, Y = L, and Y' = L' when the pixel signal having the L-th spectral characteristic is generated at the second pixel position of interest).

16. The pixel signal processing apparatus of claim 15, wherein the constants a and b in the regression equation are calculated from the following equations (3)

$$a = -\frac{k1}{k2}$$

$$b = \frac{k3}{k2}$$

$$k1 = N \cdot \sum_{i=1}^{N} (x(i) \cdot y(i))$$

$$k2 = \sum_{i=1}^{N} x(i) \cdot \sum_{i=1}^{N} y(i)$$

$$k3 = N \cdot \sum_{i=1}^{N} x(i)^2 - \left(\sum_{i=1}^{N} y(i) \right)^2 \quad (N : data \quad count)$$

...(3)

17. A pixel signal processing method that, given a group of pixel signals from pixels arrayed on a two-dimensional plane, each pixel having one of a first to an N-th spectral characteristic, generates a pixel signal having an L-th spectral characteristic at a first pixel position of interest where there is a pixel signal having a K-th spectral characteristic (K and L being different integers between 1 and N, inclusive), comprising:

a regression analysis step for performing a regression analysis in a plurality of pixel positions in an area neighboring the first pixel position of interest, with the pixel signal having the K-th spectral characteristic as the explanatory variable and the pixel signal having the L-th spectral characteristic as the purpose variable, to calculate a regression equation expressing a correlation of the pixel signal having the K-th spectral characteristic and the pixel signal having the L-th spectral characteristic; and

a calculating step for determining the pixel signal having the L-th spectral characteristic at the first pixel position of interest by applying a conversion formula based on the regression equation to the pixel signal having the K-th spectral characteristic at the first pixel position of interest.

18. The pixel signal processing method of claim 17, further comprising:

a step of receiving pixel signals output from an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane; and

a step of low-pass filtering of the pixel signals output from the imaging device; wherein

the regression analysis step uses the pixel signals obtained from the low-pass filtering as the explanatory variable and the purpose variable.

19. The pixel signal processing method of claim 17, further comprising:

a step of receiving pixel signals output from an imaging device with N types of photoelectric conversion elements, each having one of the first to N-th spectral characteristics, arrayed on a two-dimensional plane; and

a step of low-pass filtering of the pixel signals output from the imaging device; wherein

the regression analysis step uses the pixel signals output from the imaging device as the explanatory variable and uses the pixel signals obtained from the low-pass filtering as the purpose variable.

20. The pixel signal processing method of claim 17, further comprising an interpolating step for obtaining a pixel signal having the K-th spectral characteristic at a second pixel position of interest where there is a pixel signal having an M-th spectral characteristic (M being an integer from 1 to N different from K) by interpolation based on pixel signals having the M-th spectral characteristic and pixel signals having the K-th spectral characteristic at a

plurality of pixel positions in an area neighboring the second pixel position of interest, wherein:

the regression analysis step uses pixel signals obtained by said interpolation as the explanatory variable.